Table 1-1. Commercial Glass Compositions in Oxides Per Cent by Weight

Vitreous silica	Vycor	Plate	Window	Bottle or container	Bulb	Tubing	Lime tableware	Pyrex type	Ther-mometer	Borosilicate crown	Lead tableware	Glass halogen lamp	E glass	S glass	Optical flint
100.0	94.0	72.7	72.0	74.0	73.6	72.1	74.0	81.0	72.9	69.6	67.0	60.0	52.9	65.0	49.8
		0.5	0.6	1.0	1.0	1.6	0.5	2.0	6.2		0.4	14.3	14.5	25.0	0.1
	5.0							12.0	10.4	9.9			9.2		
		0.5	0.7	Tr.								0.3			
		13.0	10.0	5.4	5.2	5.6	7.5		0.4			6.5	17.4		
			2.5	3.7	3.6	3.4			0.2				4.4	10.0	
				Tr.						2.5		18.3			13.4
											17.0				18.7
	1.0	13.2	14.2	15.3	16.0	16.3	18.0	4.5	9.8	8.4	6.0	0.01			1.2
				0.6	0.6	1.0			0.1	8.4	9.6	Tr.	1.0		8.2
															8.0
		Tr.	Tr.	Tr.	Tr.		Tr.		Tr.	0.3	Tr.				0.4

Table 3-3. Field Strengths of Various Ions[a]

Element	Valence Z	Ionic radius (for $CN = 6$) r in Å	Most frequent coordination number CN	Ionic distance for oxides a in Å	Field strength at distance of O^2 ions Z/a^2	Function in glass structure
K	1	1.33	8	2.77	0.13	
Na	1	0.98	6	2.30	0.19	
Li	1	0.78	6	2.10	0.23	
Ba	2	1.43	8	2.86	0.24	Network modifier
Pb	2	1.32	8	2.74	0.27	
Sr	2	1.27	8	2.69	0.28	$Z/a^2 \approx 0.1 \ldots 0.4$
Ca	2	1.06	8	2.48	0.33	
Mn	2	0.91	6	2.23	0.40	
Fe	2	0.83	6	2.15	0.43	
Mn	2	0.83	4	2.03	0.49	
Mg	2	0.78	6	2.10	0.45	
			4	1.96	0.53	
Zr	4	0.87	8	2.28	0.77	
Ti	4	0.34	4	1.53	0.86	Intermediate
Fe	3	0.67	6	1.99	0.76	$Z/a^2 \approx 0.5 \ldots 1.0$
			4	1.88	0.85	
Al	3	0.57	6	1.89	0.84	
			4	1.77	0.96	
B	3	0.64	6	1.96	1.04	
P	5	0.20	4	1.50	1.34	
Si	4	0.44	4	1.66	1.45	Network former
Ge	4	0.39	4	1.60	1.57	
B	3	0.34	4	1.55	2.1	$Z/a^2 \approx 1.5 \ldots 2.0$
As	5	0.20	3	1.36	1.63	

[illegible] Z is the valency of the cation, and r_c and r_{O^-} are the ionic radii of [illegible] cation and the oxygen ion in Å units. If e is the electronic charge, then [illegible] the force exerted by the cation on a unit point charge placed at the [illegible] the oxygen ion. Values of the field strength for the various ions [illegible] shown in Table 3-3.

[illegible] according to Dietzel [11], the network-forming cations have high field [illegible] ($F > 0.2$), the network-modifying cations have low field strengths [illegible] to 0.4), and those having F values between 0.5 and 1.1 are the [illegible] cations. Apparently, the high-field-strength cations repel each other [illegible] by. At the same time, their small size requires low-coordination-number [illegible] with the oxygen. The two factors promote disordered arrange-